CLAIMS

1. A cooling system for a liquid cooled internal combustion engine including a cylinder block having a cooling jacket and a cylinder head mounted on the cylinder block and having a cooling jacket connected with the cooling jacket of the cylinder block for serial coolant flow through the block and the head from a first coolant inlet in the block to a coolant outlet in the head; the improvement comprising:

a second coolant inlet connected with the cooling jacket of the cylinder head;

a pump connected between the coolant outlet and the coolant inlets to pump coolant through the system;

a heat exchanger connected to discharge excess heat from the coolant leaving the outlet;

the heat exchanger connected with a water pump and the water pump connected with the first coolant inlet in the block for circulating liquid coolant through the system; and

a diverter valve connected between the pump and the first and second coolant inlets to the block and head respectively,

the diverter valve adapted for modulating coolant flow from the pump between a position of full coolant flow to the first coolant inlet to the cylinder block and a position of full coolant flow to the second coolant inlet to the cylinder head

2. A cooling system as in claim 1 including a controller responsive to coolant temperatures in the block and the head and controlling the diverter valve to maintain the coolant temperatures in a predetermined manner.

3. A cooling system as in claim 1 including at least one thermal sensor monitoring coolant temperature in the cylinder block and at least one thermal sensor monitoring coolant temperature in the cylinder head.

4. A cooling system as in claim 1 including a temperature control valve connected to control coolant flow through the heat exchanger and a bypass between the temperature control valve and the water pump and operable to direct coolant around the heat exchanger.

5. A cooling system as in claim 1 including a heater core connected in parallel with the heat exchanger.

6. A cooling system as in claim 2 wherein the water pump is an electric variable speed pump.

7. A cooling system as in claim 6 wherein the controller regulates the speed of the water pump.

8. A cooling system as in claim 6 wherein the water pump is operable to circulate coolant through the system during a cooling period after the engine stops.

9. A cooling system as in claim 8 including a bi-directional fan operable to cool the heat exchanger.

10. A cooling system as in claim 9 wherein the fan is operable in reverse to draw cooler air over the engine and discharge it through the heat exchanger for a cooling period after the engine stops.

11. A cooling system as in claim 4 wherein a controller actuates the temperature control valve.

12. A cooling system as in claim 1 including heat pipes positioned to transfer excess heat from combustion exposed portions of the cylinder head directly to the coolant in the cylinder head jacket.

13. A method for controlling a cooling system of a liquid cooled internal combustion engine including a cylinder block having a cooling jacket and a cylinder head mounted on the cylinder block and having a cooling jacket connected with the cooling jacket of the cylinder block for serial coolant flow through the block and the head from a first coolant inlet in the block and an outlet in the head, a second coolant inlet to the cylinder head coolant jacket, a pump connected between the coolant outlet and the coolant inlets to pump coolant through the system, a heat exchanger connected to discharge excess heat from the coolant leaving the outlet, and a diverter valve connected between the pump and the first and second coolant inlets, the method comprising the steps of:

controlling coolant temperatures in the cylinder block and cylinder head by diverting as needed a portion of coolant flow around the block directly to the second inlet of the cylinder head, thereby reducing coolant flow through the block while maintaining total coolant flow through the head.

14. A method as in claim 13 wherein the diversion of coolant is controlled by the diverter valve.

15. A method as in claim 13 including the step of:

reducing coolant flow from the pump to the engine as needed to warm up the cylinder block and head to predetermined control temperatures.

16. A method as in claim 15 wherein coolant flow through the engine is varied by varying pump output.

17. A method as in claim 13 including the step of:

limiting cooling of the coolant by bypassing coolant around the heat exchanger as needed to reach and maintain a desired coolant temperature into the engine.

18. A method as in claim 17 including the step of:

varying air flow through the heat exchanger as needed to control coolant temperature at a desired value leaving the heat exchanger.

19. A method for cooling an engine after shutdown, the method comprising:

reversing air flow of the cooling fan to draw cooler air past the engine to the heat exchanger, thereby cooling the engine with the passing air flow.

20. A method as in claim 19 including continuing coolant flow through the engine and heat exchanger for a period to maintain engine cooling after shutdown until coolant temperature is reduced to a desired value.

21. A method as in claim 20 including using an electric variable speed pump for continuing coolant flow.